

California Antique Radio Gazette

Official Journal, Southern California Antique Radio Society.

VOLUME 15

AUGUST 1990

NUMBER 3

The Music Master



Only
\$29⁰⁰

A high grade loud speaker built to reproduce pure mellow tones. This speaker may be used with any set using two or more tubes. The 14-inch bell of the horn is made of finely grained mahogany wood. This bell fits into a black enameled cast aluminum gooseneck and is held in place by a nickel plated ring of special alloy. The base, which contains the reproducers, is of art metal, having a felt bottom to prevent scratching. Height, over all, 21 inches. Attractive in appearance and requiring no batteries for its use. Shipping weight, 14 pounds.

57A2153 1/4 ...\$29.00

The Radialamp



Only
\$29⁹⁵

Something entirely new. A beautiful Electric Table Lamp, with a popular parchment shade and an ornamental base and stand, combined with a very high grade loud speaker. May be used independently as a lamp or radio horn, as desired, or combined. The lamp is equipped with two sockets for light purposes, and two cords, one is 8 feet long, for connecting the lamp to the house lighting circuit, and the other is 5 1/2 feet for connecting to the radio set. Shipping wt., 18 lbs.

57A2188 1/4 ...\$29.95

The Veritone



Only
\$7⁵⁰

A moderate priced loud speaker that will give you more volume than any of the medium priced horns that are now being sold. This horn is made of fiber, and has a 12-inch bell. The base is made of metal fitted with a good loud speaker unit. Entire height, 21 inches. Shipping weight, 9 lbs.

57A2187 1/4 ...\$7.50

HORN SPEAKER SURVEY

SOUTHERN CALIFORNIA ANTIQUE RADIO SOCIETY

Incorporated, Non-profit Organization

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SCARS is a non-profit organization. Its purpose is to preserve the history of wireless communication by encouraging the acquisition, preservation and exhibition of antique wireless and radio apparatus and publications pertaining to its history and development.

SCARS promotes social contacts through meetings held four times a year at various locations in Southern California. Featured at these meetings are contests, swap sessions and talks by members and guests on subjects of interest to collectors.

The club publishes quarterly the *California Antique Radio Gazette* which features news of club activities, hints on restoration, and advertisement of radio related items available for sale or trade. It is furnished free to all members. Ads are printed free for members. SCARS assumes no responsibility for the condition of items sold at swap meets or through *Gazette* ads.

Membership is open to anyone having a genuine interest in preserving equipment and history of early wireless and radio equipment. Dues are \$10.00 per calendar year.

ADDRESS INQUIRIES TO:

Official Correspondence Chuck Strozier
Application to Join Edward Sheldon
Submittal of Dues Mary Ireland
Gazette Articles and Ads Joe Knight or Floyd Paul

The opinions expressed in the *Gazette* are those of the authors and may not reflect the opinions of the editors or the SCARS membership.



PRESIDENT'S MESSAGE

The highlight of the May Meet was the auction. Fifty three items were auctioned off to an audience of over 100 club members.

Special thanks go to Mike Adams for coming down from Northern California to serve as our talented and witty auctioneer. He kept the pace moving and the money flowing. Turnout for the meet itself was greater than ever due partly to the rained-out meet in February and the press coverage in the L.A. Times at the beginning of May. If this keeps up, even the Velvet Turtle's parking lot will be too small for us.

Over 150 responses to the newspaper article were reviewed by SCARS officers. About half requested membership information and the rest were simply interested in selling an old radio or two. Current membership is over 700 but should be back to 800 by the end of the year.

Congratulations to Floyd Paul and Joe Knight, co-editors of the *Gazette* for designing and producing the best looking *Gazette* we've ever had. The higher quality paper stock, photographs, and printing techniques were well worth the few cents extra cost.

Chuck Strozier
SCARS President

Lunch for August

Lunch for the next meeting will be at 11:00 AM. Cost will again be \$7.00. Send check to Murrel at least one week before the meet.

NEXT MEETING AUGUST 18 TORRANCE

7:00 AM Buy, sell, trade activities
10:00 AM Contest equipment come in

11:00 AM Business meeting

11:30 AM Lunch

12:30 PM Program (may include radio books for auction)

1:30 PM Wrap up of program and adjourn.

NOTE

All sellers will be assessed \$3.00 at the Aug. meeting.

Buyers please note:

Would all buyers please park to the left in the parking lot. Leave the right four lanes for sellers.

NOTICE

Only SCARS members may sell at SCARS meets.

CONTEST

Contest chairman Bob Zelenack announces categories for the contest in August. Be prepared to bring your equipment.

- (1) Crystal sets
- (2) One and two tube kits (assembled and unassembled)
- (3) Amateur and early communication receivers (pre 1950)

Hotel Reservations

Paul Thompson has located another hotel for Friday evening of Aug. 17. It is the Marriott, Court Yard hotel at 2633 W. Sepulveda. This hotel is some five blocks from the Velvet Turtle. (Very Convenient) Show your AARP card and obtain a \$51.00 room rate for two.

Call early and state you are a SCARS member. Their number is (213) 533-8000.

HORN SPEAKER SURVEY

(This article is reprinted courtesy ARC.)

THE ANTIQUE RADIO CLASSIFIED HORN SPEAKER SURVEY RESULTS

PREPARED BY JOHN V. TERREY - WITH THE ASSISTANCE OF FLOYD PAUL
APRIL 1990

In its May 1989 issue, *Antique Radio Classified* printed an eight-page questionnaire listing 646 horn speakers from 334 manufacturers, and requested readers to indicate those they owned and to estimate of the value of each. The goals of the survey were:

1. To determine the range of current values for horn speaker models
2. To determine the distribution of various horn speaker models surviving today.

Floyd Paul, the author of the *Radio Horn Speaker Encyclopedia*, provided the manufacturer and model listings from his book. He also reviewed the questionnaire, adding additional horn models. Data from an ownership survey conducted by Floyd Paul also was made available for comparison purposes.

The resulting data from A.R.C.'s survey of sixty-one collectors and sources have been combined for the results presented here.

OWNERSHIP SURVEY

The ownership survey of 59 collectors concluded that most horn collections are relatively small. In fact, as shown in Figure 1, over seventy percent of collections contain ten horns or less. The average collection size is about twelve horns, and few collections exceed thirty horns.

The distribution of horns by manufacturer is shown in Figure 2. Note that the data gathered by Floyd Paul, also tabulated in Figure 2, closely tracks that collected by A.R.C. Over 50% of the horns in collections are from only seven manufacturers: Atwater Kent, Magnavox, RCA, Western Electric, Music Master, Tower and Winkler/Reichmann.

VALUE SURVEY

What contributes to the value of a horn speaker, or any other collectible for that matter? For horns and radios, the factors are: rarity, technical design, historical significance, aesthetic design, area of the country, collectibility (difficult to define) and condition. All of these factors contribute to the value estimates made by the participants in this survey. Value estimates were requested for complete horns in very good condition and working.

The ownership and value data made possible the analysis of the relationship of value and rarity. Figure 3 shows the relationship of relative ownership of horns for Atwater Kent, Magnavox and RCA horns and the value for each horn type. Rarer horn types tend to have higher values, not an unexpected relationship.

The Value Survey results themselves, shown in Table 1, were derived from the estimates from 46 collectors plus estimates from A.R.C.'s value guide for 39 horns in the May 1986 issue and values for 29 horns from *Johnson's Guide to Old Radios*. Results are presented for 133 different models of horns.

For each model type, an average value was calculated. Two criteria were required before the average values were considered sufficiently valid for inclusion in the table:

1. At least two separate estimates of the horn's value had been made, and
2. The range of the individual estimates of value must be in reasonable agreement, that is the price estimates must be clus-

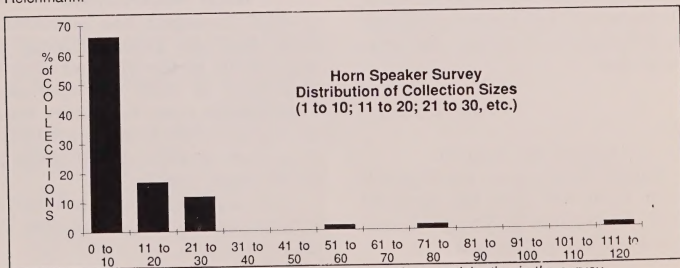


Figure 1. The distribution of the sizes of collections participating in the survey.

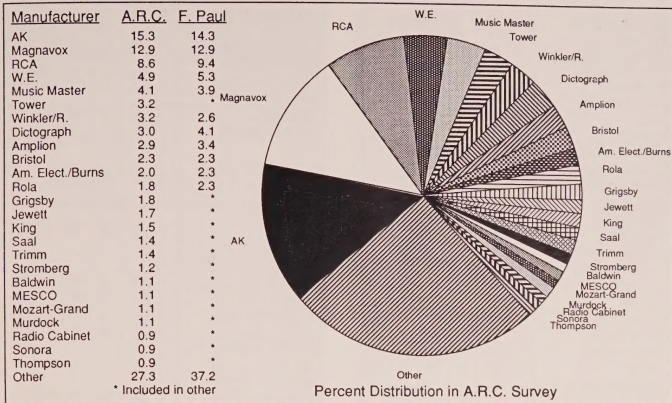


Figure 2. Percent distribution of horns by manufacturer in A.R.C. and Floyd Paul surveys.

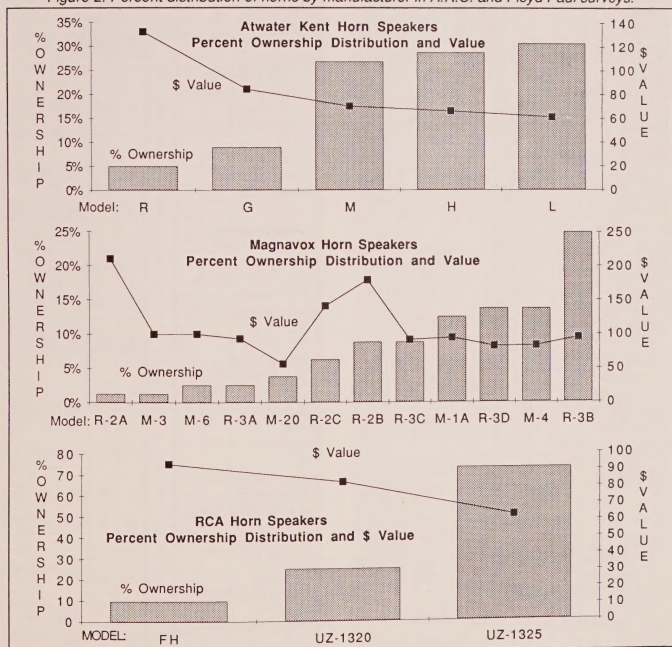


Figure 3. Comparison of percent of ownership ("rarity") and value.

Horn Speaker Survey	#	#	- Value Range -			
Final Results	Own	\$	From	Avg.	To	+/-
© 1990 John V. Terrey	(1)	(2)	(3)	(4)	(5)	(6)
Acme Apparatus Co.						
Kleerspeaker	2					
Advance Electric Co.						
Falck	1	2	79	150	221	47%
Aerofonic Co	1					
American Auto & Radio						
American Beauty	1					
American Electric Co.						
Burns 205B	5	9	120	144	169	17%
Burns 205D	7	8	134	184	234	27%
Burns 205P	1					
Amplion Corp. of America						
AR-102, Dragonfly	4	5	148	164	180	9%
AR-111, Junior	2	4	121	146	172	17%
AR-114,						
New Jr. De Luxe	1	2	170	188	205	9%
AR-19, Dragon	10	9	131	159	188	18%
AA18, Patrician	1	3	119	180	241	34%
AR-100	1	2	45	63	80	28%
Atlas-Colonial Corp.						
101	1					
Atwater Kent						
Model G	9	10	56	84	112	34%
Model H	29	26	45	66	87	32%
Model L	31	22	44	61	77	27%
Model M	27	23	48	70	91	31%
Model R	5	6	86	132	178	35%
Auto Parts Mfg. Co.						
(Jerome Radio Corp.)						
Trutone	1	2	138	145	152	5%
Autovox Co.	1					
Baldwin, Nathaniel, Inc.						
Standard	5	6	37	55	73	33%
Concert	1	3	53	72	91	26%
Concert Grand	1	2	74	78	81	5%
Bel Canto Corp.	1					
Bennett, I.A. and Co.						
(See Cook)						
Auditorium	1	2	122	133	143	8%
Best Mfg. Co	2	3	53	87	121	39%
Borkman Radio Corp.						
Velvet 15	1					
Velvet 21	1					
Boudette Mfg. Co.						
Sonochorde B	4	4	57	81	106	30%
Sonochorde C	1					
Brandes Mfg. Co.						
Table Talker	6	7	40	47	54	15%
Bremerman, F., and Son						
Orchestron DeLuxe	1					
Bristol, The, Co.						
C	3	3	36	57	77	36%
J	4					
S	1	2	88	95	102	7%
Baby	3	2	75	75	75	0%
Jr. Audiophone	1	2	56	70	84	20%
Sr. Audiophone	3	2	120	138	155	13%
Brittania Silver Casting Co.						
Humantone	1					
Callophone Co. of N.Y., Inc.						
R 1202	2	3	131	148	166	12%

Horn Speaker Survey	#	#	- Value Range -			
Final Results	Own	\$	From	Avg.	To	+/-
© 1990 John V. Terrey	(1)	(2)	(3)	(4)	(5)	(6)
Clapp-Eastham Co.						
Electro-Ampliphone	1	3	95	170	245	44%
Clearstone Radio Co.						
S-Neck Style	1	2	69	108	146	36%
Conn. Instrument Co.						
C.I.C.	1					
Davis, Richard T., Inc.						
Vogue 10	3	3	75	78	81	4%
Vogue 13	1					
DeForest Radio Co.						
300	4	6	66	108	151	39%
Dexter Metal Mfg. Co.						
Dictograph Products Corp.						
Portable	4	4	81	102	122	20%
Upright	1	2	53	60	67	12%
Dictogrand	14	13	62	83	104	25%
Motor	1	2	28	35	42	20%
Doolittle Radio Corp.						
Amplifone	1					
Federal Tele & Tele Co.						
Pleiohphone, 400-W	2	2	140	175	210	20%
180	1					
Firth Radio Corp.						
Vocaloud						
Type 1 (Station)	1	2	200	200	200	0%
Vocaloud						
Type 2 (Station)	2					
Florentine Art Productions						
Voice of the Sky	4	4	241	306	372	21%
Freed-Eisemann Radio Corp.						
FE 50	1					
Frost, Herbert H.						
Musette 10B	3	4	32	58	83	44%
Gale Radio Labs.						
Towncrier	3	3	64	87	110	27%
General Radio Corp.						
(See Music Master)						
Geraco	3					
Great American Radio Co.						
Milo Supreme	1					
Grigsby-Grunow-Hinds Co.						
Majestic BG	4					
Majestic WG-10	6	6	58	73	87	19%
Majestic WG-20	1					
Majestic WG-50	1					
Hartman Electrical Mfg. Co.						
B, Pedestal style	2	3	153	192	230	20%
Hawley	3	2	38	45	52	16%
Herald Electric Co., Inc.						
B	4					
Holzer-Cabot Electric Co.						
Universal 112	3	3	66	72	77	8%
Jewett Radio and Phono.						
Super Speaker	10	13	47	68	89	31%
Console (cab.)	1					
Jodra Mfg. Co.						
Enchanter	1	2	69	73	76	5%
Kello Switch. & Supply Co.						
Symphony	5	4	49	78	106	37%
Kennedy, Colin B., Co.						
610	1	2	65	100	135	35%
620	1					

Table 1. (See page 6 for explanation of table.)

Horn Speaker Survey	#	#	- Value Range -			
Final Results	Own	\$	From	Avg.	To	+/-
© 1990 John V. Terrey	(1)	(2)	(3)	(4)	(5)	(6)
Kent, F. C., Co.						
Kentone	1	2	125	125	125	0%
King						
Amplitone	10	9	71	139	208	49%
Kirkman Eng. Corp.						
K-E	2					
Kodel Radio Corp.						
Microphone style	5	7	89	126	164	29%
Microphone-lamp style		2	175	175	175	0%
Magnavox Co.						
M1-A	10	10	55	94	134	41%
M3	1	2	65	100	135	35%
M4	11	12	59	83	107	28%
M6	2	2	65	100	135	35%
M20	3	6	34	56	78	39%
R2-A	1	3	125	210	295	41%
R2-B	7	7	134	179	225	25%
R2-C	5	6	91	141	190	35%
R3-A	2	4	67	93	118	28%
R3-B	20	13	70	95	120	27%
R3-C	7	7	71	91	110	22%
R3-D	11	13	59	82	105	28%
A1-R (1-tube amp/spkr)	3	3	204	233	262	12%
A2-R (2-tube amp/spkr)	2	3	152	246	340	38%
Manhattan Elect. Supply						
2551	3	3	35	58	82	41%
2552	1					
2554	1					
2555	2					
Mercury Radio Corp.						
Jr.	1					
Molded Wood Prod. Co.	1					
Montgomery Ward and Co.						
Airline Jr.	1					
Mozart-Grand Co.						
Baby Grand	6	8	47	84	120	44%
Upright 10	1					
Multiple Electric Products						
Altas 101	1					
Murdock, Wm. J., Co.						
500	7	8	81	119	158	32%
Music Master Corp.						
(Formerly General Radio)						
V	3	4	52	73	93	28%
VI	16	14	76	109	141	30%
VII	4	8	120	209	298	43%
VIII	3	5	37	54	71	32%
IX	1					
N & K (Neufeldt & Kuhnke)						
W	1					
Nanyo						
Microphone style	1	2	158	183	207	14%
Newcomb-Hawley, Inc.						
53	1	2	44	48	51	7%
56	1	2	42	53	63	20%
Operadio Mfg. Co.						
Junior	1					
Senior	3	4	38	63	87	39%
Ovenshire Labs	2					
Ozarka	1					
Peerless	3	2	39	60	81	35%

Horn Speaker Survey	#	#	- Value Range -			
Final Results	Own	\$	From	Avg.	To	+/-
© 1990 John V. Terrey	(1)	(2)	(3)	(4)	(5)	(6)
Perfectone Radio Corp.						
A-1	1					
Pirolloid Products Corp.						
Operatone	1					
Radiolamp Co.	1	2	250	250	250	0%
Radio Cabinet Co.						
Orchestron DeLuxe	6	7	157	197	237	20%
Radio Corp. of America						
Radiola UZ 1320	13	12	56	83	110	32%
Radiola UZ 1325	38	26	44	63	82	30%
FH	5	9	63	94	124	32%
Radio Shop, Inc.	1	2	82	93	103	11%
Reichmann Co.						
Thorola 3	4	5	47	60	73	21%
Thorola 4	4	3	41	58	76	30%
Thorola S-5	2	2	64	85	106	25%
Thorola 9	1					
Thorola Jr.	2					
Remo Corp.						
Trumpet Jr.	1	2	73	80	87	9%
Resonophone Mfg. Co.	1	2	66	130	194	49%
Rhamstine, J. Thos.						
Adapt-O-Phone	1					
Rice and Hochster						
Reflectone A	1	2	65	100	135	35%
Riley-Klotz Co.						
Arkay		2	143	168	192	15%
Rithello Corp.						
Robbins and Myers Co.	1					
Rola Co.						
Re'Creator	12	10	52	72	92	28%
Saal, H. G. Co.						
Grand 1	4	3	37	50	63	26%
Soft. Spkr..	5	4	74	81	89	9%
Schroth, Wm. J.						
Allens Horn	1					
Sears, Roebuck and Co.						
Silvertone 1	4	5	45	56	67	20%
Silvertone 2	1	2	44	65	86	33%
Selector Co.	1	2	60	78	95	23%
Signal Elect. Mfg. Co.						
Amplion Dragon	1					
Snyder, Homer P.						
Mfg. Co.	1	2	52	80	108	35%
Sonora Phonograph Co.						
Deluxe	5	4	43	58	73	26%
Standard	1	2	47	58	68	18%
Spartan Electric Corp.						
Disc.	1					
Standard Metal Mfg. Co.						
Gem	1	2	120	138	155	13%
Star Radio Co.						
Star-O-Tone	1					
Steel Products Corp.						
Songbird	2	3	40	45	50	11%
Stewart-Warner						
400	5	5	54	77	100	30%
405	2	3	53	72	91	26%
Stromberg-Carlson						
1A	5	6	71	81	91	12%
2A	3	4	46	64	82	28%

Horn Speaker Survey	#	#	- Value Range -			
Final Results	Own	\$	From	Avg.	To	+/-
© 1990 John V. Terrey	(1)	(2)	(3)	(4)	(5)	(6)
Telehone Corp. of America						
60	3	4	41	56	71	27%
62	3	4	39	45	51	13%
Temple						
13	1					
15	6	7	62	80	98	23%
Thompson, R. E. Mfg. Co.						
H3	6	5	73	93	113	21%
Thompson, Bartlett	1					
Timbre-tone Mfg. Co.						
Violin style	3	3	200	200	200	0%
Timmons Radio Products						
Talker A	3	3	42	55	68	24%
Talker N	1	2	39	43	46	8%
Tonks Brothers Co.						
Sealene	1					
Tower Mfg. Co.						
Scientific	3	3	34	42	49	18%
Meistersinger	12	12	55	70	84	21%
Little Spitfire	6	7	39	55	71	30%
Trimm Radio Mfg. Co.						
Concert 20	2	2	26	40	54	35%
Home Speaker #25	3	3	50	60	70	17%
Entertainer #90	3	2	44	65	86	33%
Grand	1					
Trinity Radio Corp.						
A1	1	2	40	75	110	47%
Utah Radio Prods. Co.						
Super Flex	5	5	48	63	78	24%
Standard	1					
Victor Radio Corp.						
Baby	1					

Horn Speaker Survey	#	#	- Value Range -			
Final Results	Own	\$	From	Avg.	To	+/-
© 1990 John V. Terrey	(1)	(2)	(3)	(4)	(5)	(6)
Vocaloud Radio Mfg. Co.	1					
Warren Radio Phone Mfg.	2	2	55	73	90	24%
Western Electric Co.						
10D	16	17	55	83	112	34%
517W	1					
518W	6	8	51	70	89	27%
521W	2	4	69	94	118	26%
521CW	2	3	44	58	73	25%
543W	1					
Shawphone	2	3	62	73	85	16%
CW929	1					
KS6368	1	2	56	70	84	20%
Westinghouse						
Vocalora	5	7	94	170	246	45%
Williams Radio Co.						
Echotone	1					
Wilson Utensil Co.						
Moon	1	3	104	133	162	22%
Winkler-Reichmann Co.						
(See Reichmann Co.)						
Thorophone S-5	6	5	70	93	116	24%
501	2					
WorkRite Mfg. Co.						
Concertola Jr.	1					
Yahr-Lange, Inc.						
Floor pedestal style	2					
Zenith Radio Mfg. Co.						
Radio Glory		2	149	238	326	37%
COUNT	195	133				
TOTAL:	708	685				
AVERAGE	3.6	5.2	77	102	126	25%
STANDARD DEVIATION:	5.2	4.7	45	53	66	12%

EXPLANATION OF TABLE COLUMNS

- (1) The total number of horns for the model type reported owned and in collections.
- (2) The number of individuals estimating the dollar value for the model type.
- (3, 4 & 5) An analysis of the range of dollar values for the

horn type. Columns 3, 4 & 5 are the low, average and the high value. (Note: The low and high are +/- one standard deviation from the average.)

- (6) The spread of the value estimates as a percent of the average price. (Note: Column 6 is the standard deviation as a percentage of the average.)

(Horn Speaker Survey, continued)

tered together and not widely spread apart. (The standard deviation of the price estimates were required to be less than 50% of the average value to be included.)

In addition, a few extremely high and low values were omitted from the analysis.

SURVEY CRITIQUE

The value estimates tabulated here should not be taken as the true prices. Since both buyers (who might tend to place lower prices on horns) and sellers (who might tend to place higher prices on horns) participated in the survey, an average price might be expected to result. However, some collectors entered the price they paid (which might have been years ago) which does not reflect the current day price.

In addition, there were a few missing model types, confusing model identifications, and typos. Although averages and standard deviations were calculated, the statistical procedures would not stand up to strict statistical scrutiny.

So, how can the results of the survey be used? I suggest the following:

1. The more common horns, those with high ownership, are easier to find and tend to sell below the average price.

2. The less common horns, those with low ownership numbers, tend to be very hard-to-find and when found, tend to sell, if at all, at the high end of the price range.

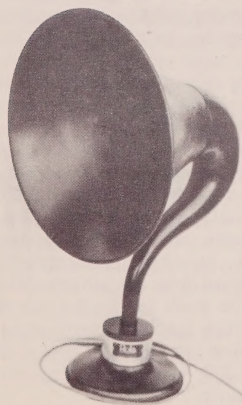
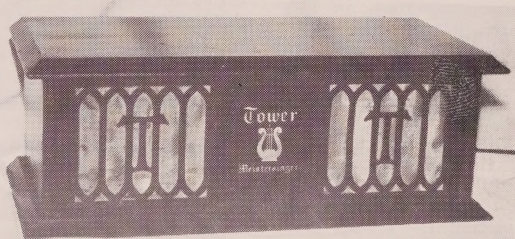
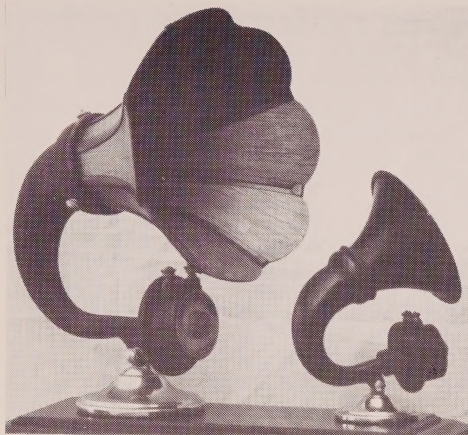
3. As always, the value of an horn includes the factors previously listed.

What should **you** pay for a horn? As usual, the price for a horn, or for a radio, depends on agreement between a seller and buyer, and depends often on how much you, and others, want it.

The *Radio Horn Speaker Encyclopedia* can be obtained from Floyd Paul for \$12.90 plus \$2.00 shipping. It also is available from A.R.C., Antique Electronic Supply, Antique Radio Club of America - West Virginia Chapter and others.

(John V. Terrey, Editor, A.R.C., P.O. Box 2, Carlisle, MA 01741. Floyd Paul, 1545 Raymond Ave., Glendale, CA 91201)

Identify
these
horn
speakers.



PREMIER HRO COLLECTOR:

HENRY T. BROWN, W6DJX

By Robert E. Grinder, K7AK

SCARS member, Henry "Hank" T. Brown's, passion for National HRO receivers has inspired him to aggregate a remarkably extensive collection of these fine receivers (see photograph).

Hank's enthusiasm for HROs blossomed 50 years ago when, as a young lad living in Florida, he accompanied his father on a visit to a nearby weather station. At the time, his interest in radio stemmed from a need to know how to tune the family BC set in order to bring in the Lone Ranger and Jack Armstrong serials. Signals emanating from an HRO situated in a rack above the station operator's desk so intrigued him, however, that he began to dream of the day when he, too, would listen to faraway stations on the wondrous receiver. Thus was born a singular focus on the HRO, which led, subsequently, to a career in communications technology and a life-long involvement in amateur radio.

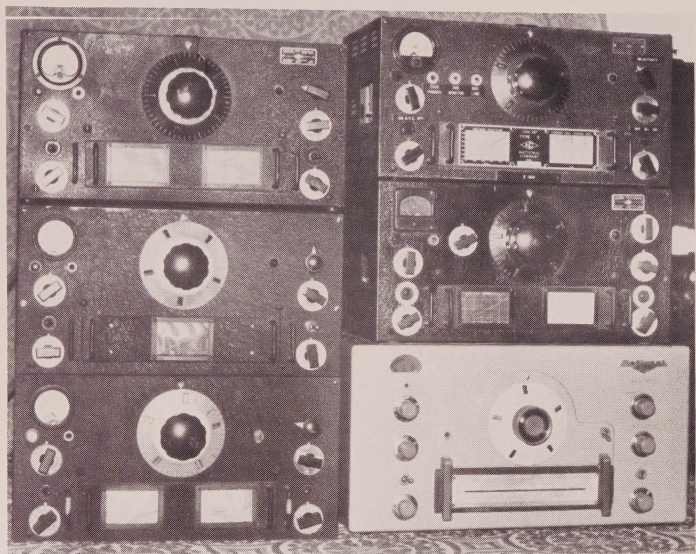
Hank's entry into the field of electronics was as a ship's radio operator, which provided opportunity to travel all over the world. Later, he worked for a time for the U.S. Army in Japan. Eventually, Hank settled in Lancaster, CA, where for several years he supervised for Los Angeles County the development and service of all communications needs in the northern part of the county. He is currently employed by the U.S. Air Force in testing electronics on new aircraft.

During adolescence, financial resources limited Hank merely to dreaming of attaining an HRO. But

his resolve to own one intensified as he traveled the world as a radio operator, visiting commercial and amateur stations. He observed that top notch operators invariably used HROs. Finally, during a visit to Seattle in 1958, the first of what would amass eventually into a great collection came into his possession. Since then he has scoured the country, from garage sales to AWA, SCARS, and TRW meets, in search of HROs. When Hank finds one, he works painstakingly to restore it to its original cosmetic appearance and factory operating condition even to the extent of taking old paper capacitors apart and inserting new capacitors inside their shells.

National Co. engineers set out in the early 1930s to produce the finest communication receiver ever, and with ensuing refinements, they set standards for the industry from the outset to the beginning of the transistor era. Few existing receivers perform today, relative to sensitivity and selectivity, as effectively as the HRO.

In the current amateur marketplace, an HRO may bring between fifty and a few hundred dollars, depending on condition and model. Cosmetic changes in production units provide rough clues to the relative status of particular models. For example, the HRO shown bottom left in the photograph is distinguished from all other models by a white push button for the S-meter, which marks it as a member of the first production run (late 1934). HRO collectors prize this model dearly.



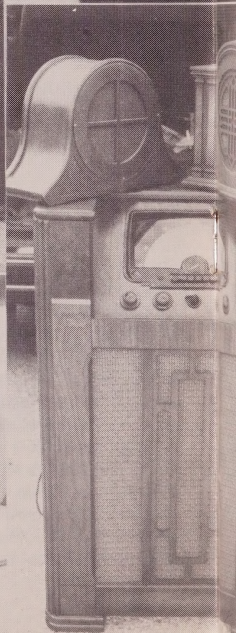
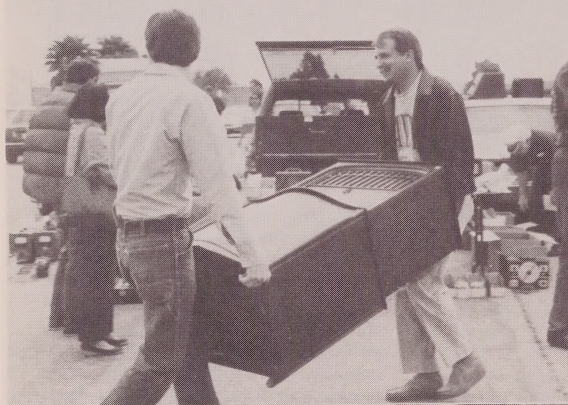
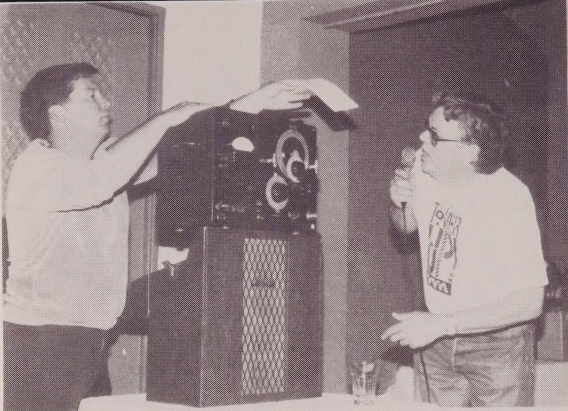
Various National HRO models. Clockwise, beginning at bottom left: First model of 1934; Late 1935; 1936-1942; World War II model; HRO-5A (1946); and HRO-7 (1947). Photo by Bud Richter, Lancaster.

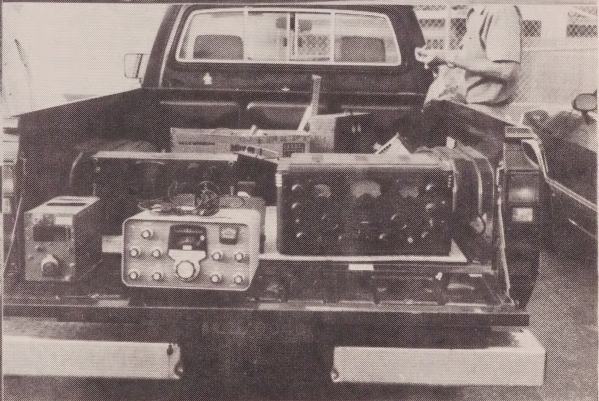
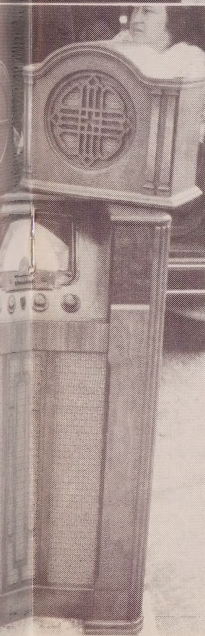
The model second from bottom on the left was released in late 1935. It is the last to have the satin-finished dial, a pilot light has been added, and the S-meter switch is now push-pull and brass. This model is relatively scarce. The HRO shown top left was produced without much change from 1936 to the beginning of WWII. Note that the meter is now enclosed in a plastic case and the crystal-phasing control has a bar knob. Of the HROs pictured, models within this range of production are relatively available.

The HRO shown on the top right is a wartime production unit, which is comparable to the later prewar

models. The model middle right is the postwar HRO 5A (1946), whose performance has been enhanced by a noise limiter (dial to right of ear-phone jack). The receiver at the bottom right is the HRO 7 (1947), which represents National's first effort to modernize the cosmetic appeal of its venerable product. Not shown are a few subsequent models in Hank's collection, including the HRO 60 and HRO 500, which are arguably the best performing HROs.







Deanna Hames, Photographer

THE NEXT BIG THING

by Mike Adams

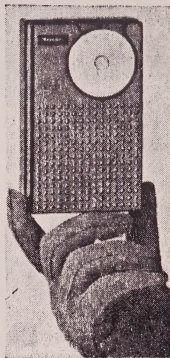
What is the next big thing in radio collecting? Remember the advice given to Dustin Hoffman in "The Graduate" about the future of America: "plastic, son, plastic." Add a few transistors and a couple of diodes to that and you may have the future of radio collecting. It's true, this latest generation of the battery set known as the transistor radio has been seen in greater numbers at the CHRS and SCARS meets in the past year. Not old enough to collect, you say? Consider that the *Antique Wireless Association*, AWA, was founded in 1952, less than 40 years after the heyday of wireless and only 20 years after the end of the battery set era. So when the late Stanford professor William Shockley and his group invented the transistor at Bell Laboratories in the late 1940's it is only logical that 40 years later in 1990, radios without tubes would be considered antique.

Why transistor radios? Partly, it is supply. Once all the AC/DC plastic, wood cabinet, battery and wireless stuff had been dragged out of those mythical attics and cellars and "restored," painted, chromed, replicated and/or traded a dozen times, they eventually ended up in their final collection and ceased being on the market. Another obvious reason for the popularity of the transistor radio is demand: most of the recent growth in radio collecting clubs comes from folks young enough to consider a '50's radio old. Conversely, in the past few years, I have seen many formerly active but older collectors declare their collections "complete" and ride off into the sunset in their Winnebagos. And

most important, the people we respect as serious historians because of their fine collections of battery sets and wireless are now among those most interested in a transistor collection. Call it the official seal of approval.

TRANSISTOR RECEIVER

A POCKET SIZE radio, 3" x 5" x 1 1/4", that uses transistors instead of tubes is being produced by *Regency*, Indianapolis. The tiny set is powered by a self-contained battery and plays through its own permanent-magnet loudspeaker. Said to be the first of its kind, it sells for about \$50.



Advertisement is from the Jan., 1955 copy of *Popular Electronics*.

There are plenty of sound reasons why a new collector might be interested in the transistor radio. First, prices, while rising rapidly, are still realistic. Second, there is ample supply in places other than radio swap meets, like your mother's garage and the neighborhood yard sale. Practically, there is no wood to refinish. With the big console, you always had to either look for a perfect one or find some non-radio person to do the cabinet work. The results varied from a shiny, plastic-coated, highly reflective finish to a greasy ad for Old English, neither with the original patina of fine

furniture. With a transistor set, the solution to a cracked plastic part is to get several of the same set and make one good one. And the transistor radio is ultimately going to make collecting safer with no lethal voltages and no filters to replace. On a more cynical note, I also predict that they'll be as popular to service as televisions.

Why aren't more new collectors interested in battery sets? Wireless? Here in California, at least, we have to make house payments. Besides, once you find the perfect AK breadboard or that rare Marconi magnetic detector, you tend to want to keep it forever. The result is that the great sets stay in the hands of a few and the mediocre ones constantly get traded back and forth.

Why not cathedrals? Have you seen a decent one lately, one that hasn't been restored a dozen times? At a recent radio meet I saw a Philco 90 for sale that was so "restored," even its chassis was chromed. I rest my case. What about literature? As one who has collected radio-related printed material for quite a few years, the sight of a \$24.00 copy of a single Radio News from the 1920's is not encouraging. And finally, you ask, what about those desirable FADA and Emerson plastics? It's those house payments again.

Yep, since the rise of the yuppie and the Melrose Avenue boutique, we mere mortals have been priced out of that market. At the May SCARS meet, I saw a plain, even mediocre Addison for \$900.00. You can still buy a hundred transistor sets for the price of a single Catalin.

So for a lot of good reasons, historical, aesthetic and economic, it looks like the transistor radio is

going to be the next big thing. Your mission is to revisit those thrift shops, generic flea markets, garage sales, even your in-laws and bring all these sets into the radio collecting community. If, as it appears, we are running out of traditional collectible radios of quality at a fair price, the serious radio collector will either have to stop collecting or get interested in another part of the hobby. The transistor radio is probably the natural progression of collecting interest because they are plentiful, they haven't been discovered by rich people, and they are small enough and colorful enough to fit into any decor. Sooner or later, you'll collect them.

Auction Follow-up Report

by Joe Knight, Auction Chairman

1. Total value of all auction items was \$1300.
2. Total of SCARS proceeds including donations was \$465.
3. Total items auctioned was 53.
4. Total bidders was 32.
5. I would like to sincerely thank Mike Adams for being our auctioneer again this year and making this an enjoyable event. Mike drives from the Bay area to be with us for this annual event. Next, I would like to express my gratitude to the club members who so willingly gave of their energies to help out at the registration table and assist in auction activities. (specifically thanks to Mary Ireland and Margaret Thompson). Finally, to all the sellers, bidders and donators of items I express thanks. Let's do it again next year.

INSTRUMENTS AND MEASUREMENTS

By Ed Sheldon

SIGNAL TRACERS

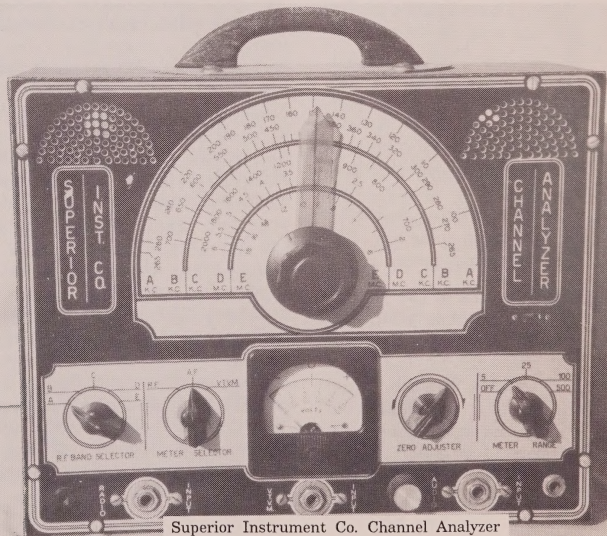
The late John F. Rider was an ardent advocate of signal tracing. He published a 360 page book in 1939 titled *Servicing by Signal Tracing* which is a good reference book because of the circuit descriptions that are given. It gives a lot of information about radio servicing in general. The idea is simple. You trace the signal from either a strong local station or a modulated signal generator from the antenna and ground terminals clear through to the loud speaker. A signal tracer could be a wide band oscilloscope or even something as simple as a set of headphones and a crystal detector. The more elaborate signal tracers used tuned amplifiers and covered a wide range of frequencies over which

measurements could be made. D.C., audio 20-20,000 cps, R.F and I.F. 95-1700 kc, and high frequencies up to 15 mc in the case of the Hickok model 156 Traceometer.

Signal tracers are interesting and fun to collect. They covered a period of around 1938 to 1958. Homebrew testers were abundant. Radio News featured many "how to" articles. See *Radio News* Sept. 1944 and Aug. 1948 for more information.

A list of collectable and interesting signal tracers is;

1. RCA Rider Chanalyst
2. Hickok model 156
3. Meissner model 10-1154
4. Superior Instrument Co. Channel Analyzer
5. Supreme Audiolyzer



Superior Instrument Co. Channel Analyzer

A TECHNOLOGICAL
SURVEY
OF BROADCASTING'S
"PRE-HISTORY,"
1876-1920

ELLIOT N. SIVOWITCH

A Technological Survey of Broadcasting's "Pre-History" 1876 - 1920

by

Elliot N. Sivowitch

**Division of Electricity and Nuclear Energy
Smithsonian Institution**

About the author: ELLIOT SIVOWITCH (K3RJA) A.M. Syracuse University 1957 specializing in history of radio. Since 1961 he has been a museum specialist with the Smithsonian Institution Division of Electricity and Modern Physics. He is a member of IEEE and several sub-groups including the Communications Society and Broadcast, Cable, and Consumer Electronics Society; the Society of Motion Picture and Television Engineers; the Audio Engineering Society; and the American Institute of Aeronautics.

His journalism credits include Editorial Coordinator for Tyne's *Saga of the Vacuum Tube*; the Board of Consultants for the "Journal of Broadcasting" and the Arno Press Editorial Board (Communications) Elliot authored "Musical Broadcasting in the 19th Century," among other articles in the field of communication. An Honorary member of the A.W.A., he has appeared on several conference programs. His hobby? Old violins.

IN the period prior to 1876, the telegraph, in its various forms, was the principal rapid news conveyor throughout the world. The transmission of information in this manner can be construed as "broadcasting" only if one interprets the usual definition ("the dissemination of radio communications intended to be received by the public, directly or by the intermediary of relay stations") in the sense of "wide dissemination of information, not necessarily at the same point in time." For the purposes of this paper, we will use a very broad definition and will include experiments that might more properly be related to point-to-point communication than to current definitions of broadcasting.

Wired Broadcasting

The telephone's introduction in 1876 forced a revolution in communication capability with wide ranging social and economic implications. Not only could more words per minute be transmitted, in both directions, but anybody could use the telephone without special training in code. This magic of voice transmission over wire led 19th century innovators to serious thoughts concerning the transmission of news and entertainment simultaneously and instantaneously to multiple receiving points. Although broadcasting by wire was hampered by equipment limitations with regard to fidelity and amplification, the idea was sufficiently intriguing to be explored by engineers both in this country and in Europe. Commercial development, however, was considerably greater abroad, where sound "rediffusion" (analogous in many ways to CATV) still exists in many places.

The beginnings of wired broadcasting can be traced to a "pre-telephone" transition period after 1860, when a number of experimenters were developing methods for transmitting musical tones over telegraph wire lines. These activities may have culminated in the work of Elisha Gray, who conducted several tests of "electroharmonic" broadcasting to audiences in 1874 and 1875.¹ Following a successful demonstration by Alexander Graham Bell of the speaking telephone at the 1876 Philadelphia Centennial Exposition, the possibilities of using it as a broadcast instrument were apparent. In the Fall of 1876, experimental "concerts" were transmitted over wire line by Bell from Paris to Brantford, Ontario, utilizing a "triple mouthpiece" telephone transmitter to accommodate several soloists. From 1876 through 1880 a variety of transmissions were conducted, both in this country and in Europe. The carbon transmitter, co-invented during this period by Edison, David Hughes and Emile Berliner, enormously increased the power output of the telephone. In 1881, Clement Ader, in France, conducted intensive investigations of wired stereophonic broadcasting at the Paris Electrical Exposition, and by 1895 various European Opera Houses were equipped with either stereo or monophonic telephone systems. In 1893 a commercial broadcasting system called the Telefon-Hirmondo (Telephonic Newseller) began operation in Budapest, Hungary, and shortly afterward the Electrophone Company started service in London. The Budapest operation was a highly sophisticated system that provided regular news and music programming up

to 12 hours per day.² Although the European activities were reasonably successful, the United States did not see similar developments until the Cahill Telharmonium broadcasts more than a decade later.³ However, there were frequent occasions here of subscribers being "wired up" for specific church service broadcasts or special events. Of more than usual significance was the broadcasting of Congressional and local election returns by the Chicago Telephone Company on Nov. 6, 1894. It was estimated that more than 15,000 persons were reached by this novel transmission method.⁴

Loomis-Ward Aerial Conduction Telegraph

19th century thoughts on broadcasting were not limited to land line experimentation. On April 30, 1872, William Henry Ward of Auburn, New York, received a patent for a telegraphic tower (No. 126356) that might be said to embody the earliest conception of transmitting signals by wireless from a single antenna to a multiplicity of receiving aerials. In the wording of the patent:

Different towers may be erected on the different continents, and if they are all what is technically called hooked on—that is to say, connected to the earth—a signal given at one tower will be repeated at all the towers, they being connected with each other by the aerial current.

No mention of the telephone, of course, at this early date. However, a word of caution should be mentioned here. The "wireless" system described is that of *conduction transmission*, a technique developed by telegraph engineers after 1838 when it was discovered that two wires were not necessary to complete a circuit. One could be eliminated and a return made through the ground. All sorts of intriguing possibilities were then thought of, including the idea of communicating across bodies of water. The particular technique which Ward envisioned involved the elimination of both wires, the use of the ground and bodies of water as a substitute for one wire, and the "conducting atmosphere" in place of the other wire. The inspiration for communicating through the atmosphere in this manner appears to have developed from observations of the effect of the aurora borealis on telegraph lines. Auroral storms created all sorts of havoc on domestic telegraph circuits including the freak ability to send messages over wire line with induced currents, entirely eliminating the need for batteries. If such electricity in the upper atmosphere could be harnessed,

what a tremendous boon for global communications! We have no evidence however, that Ward actually built a tower (which, by the way, looks in the patent application drawing very much like the modern space-satellite communications antenna in Andover, Maine—although, of course, operating on entirely different principles) and conducted experiments. Ward was principally an independent inventor in mechanical technology, with a concentration in railway car coupling devices. However, during the 1850s and 60s he developed a rather sophisticated semaphore signalling system for maritime communication, and published a book describing his coded symbols in some detail.⁵ Sometime during this period he appears to have made the acquaintance of Mahlon Loomis and possibly was influenced by the latter's thoughts on conduction telegraphy. Loomis (1826-1886), a Washington D. C. dentist, was the principal 19th century exponent of aerial conduction communication. Loomis' thoughts on wireless transmission date back to the great auroral storm of 1859 which was particularly vexing to telegraph operators in the Northeast United States.⁶ Loomis seems to have conducted several tests in the Blue Ridge and Catoctin mountain ranges of Virginia and Maryland in the 1866-72 period but a detailed account of the equipment used and persons present is lacking. However, he obtained considerable support in Congress and probably would have received an appropriation had not the financial panic of 1873 struck.⁷ The most important question, of course, from the engineering point of view, is whether the Loomis-Ward system could have worked in terms of the design theory assigned to it. The answer is "no," with the qualification that under certain unusual conditions in the ionosphere, some deflection of the receiving galvanometer might be noticed. What is more likely is that Loomis radiated some electromagnetic energy from discharges of atmospheric electricity at the transmission end. Again, firm evidence is not at hand. Loomis was granted a patent for his system July 30, 1872.⁸

Although the aerial conduction scheme passed into obscurity, systems involving conduction through the ground appeared over the next few decades and have been revived in modern times. These, however, were viable systems without any question, though only over limited distances. So far as our broadcasting story is concerned, however, ground conduction becomes intertwined with certain other related phenomena in the developing telephone technology.

We mentioned earlier the experimental telephone "concerts" promoted soon after the instrument was introduced. In 1877, a telephone "broadcast" was made from New York City to Sarasota Springs, New York, using a newly developed Edison transmitter. The musical programming was heard accidentally in both Providence and Boston due to electrical leakages between adjacent sets of wires on trunk lines north of New York City. Although conduction leakage through the ground was the principal cause, *induction* through the air also was involved. Within both phenomena lay mechanisms for a new mode of communication: suppose one were to purposely cause induction of energy with large loops of wire, or conduction with stakes buried in the ground—would not a useful communication device result? This line of development appealed to several late 19th century personalities, though considerable thought toward wireless techniques of this general type was in evidence even prior to 1850.⁹ The crucial point to remember, however, is that the scientific base for induction-conduction communication was a natural outgrowth of conventional telegraph and telephone technology, and was not directly related to the Hertz-Marconi approach to wireless. The latter method employed radiated waves of high frequency which had the capability some distance. However, there are certain interrelationships between these various systems which we will describe in the following critical review of the work of one early "wireless broadcaster."

Nathan Stubblefield

Nathan B. Stubblefield (1860-1928), of Murray, Kentucky, was a self-taught tinkerer-experimenter. He is more in the tradition of Daniel Drawbaugh than Edison or any of the university savants.¹⁰ However, he has a persistent vision of the success of his method of communication and influenced several businessmen to finance commercial exploitation. His first claim to fame, however, came via local "acoustic telephone" hookups in Murray circa 1890.¹¹ Following investigations into induction and conduction telephony, he developed several types of apparatus and performed some public demonstrations prior to 1900. In March 1902 he succeeded in transmitting speech from a boat in the Potomac River to shore-based receivers. Inspired by this operation he boasted of the practicability of sending simultaneous messages from a "central distributing station" and of conveying the "general transmission of news."¹² However, commercial thoughts

were directed toward point-to-point communication. The Wireless Telephone Company of America was formed and an active stock promotion plan put into operation. Although the stock prospectus was quick to point out the virtues of a cheap wireless system versus the expensive Bell Telephone lines, the fact of the matter was that induction/conduction telephony was too marginal in distance capability to offer any serious competition to Bell. The Gordon Telephone Company of Charleston, South Carolina, did purchase some equipment to communicate with off-shore islands, but this was about the extent of the operation's success.¹³ Stubblefield became disillusioned with the stock promotion schemes of his financiers and withdrew to seclusion in his workshop. He did receive identical United States and Canadian patents in 1903 for the induction system¹⁴ and an examination of the basic principle may prove useful.

A battery and telephone were to be connected in series with a very large coil of wire (i.e. transmitting "antenna"). Upon speaking or singing into the microphone, audio frequency currents would flow in the loop, and an alternating current induction field would form in the vicinity of the "antenna." A pickup-loop mounted atop a moving vehicle would act as the receiving aerial and feed a simple telephone receiver. Now here is the critical point: most of the energy in the induction field is contained in the vicinity of the transmitting loop. The field, however, is varying at an audio-frequency, so far as this is concerned it obeys the same law as any varying field in space, regardless of frequency. Why isn't this radio? It turns out that we can determine from electromagnetic theory that there are three components of a varying electromagnetic field in space, one whose electric field intensity varies inversely as the cube of the distance, $1/R^3$ (static field), one inversely as the square of the distance, $1/R^2$ (induction field), and one inversely as the distance, $1/R$ (radiation field). Some energy is *radiated* away from the antenna at any frequency, but at *low frequencies* (i.e., voice and music) most of the energy is confined to the vicinity of the wire.¹⁵ The induction field is the principal component of the Stubblefield system, and this limited the transmission range of the system to something less than three miles. (This is not to be confused with the case where we superimpose voice or music on a higher radio frequency and make full use of radiation capability, as in modern broadcasting.)¹⁶

The mathematical processes and field theory outlined above were known in 1908, but at this stage of the game, the fine points of difference between the various wireless systems were not appreciated; after Marconi's work became known in this country many were quick to point out that Stubblefield had transmitted voice (not just Morse Code) via "wireless" as early as 1892.

Edison, Dolbear, Thomson and Stone

More than a decade before Stubblefield's first experiments, there was a line of development in which double-winding induction coils similar to the types employed in early telephone work and in physics laboratories were utilized. In some circuit configurations an induction field would predominate, and in others radiation capability existed, but the state of the art was such that most electricians and physicists failed to recognize the capability of the induction coil in the production of high frequency waves. Several persons were on the fringe of exciting discoveries but "missed the boat" by narrow margins. Included in this group were Thomas Edison and Elihu Thomson, who conducted a variety of investigations in the 1870s in which electrical sparks produced by a generator could be detected at a distance.¹⁷ Only Heinrich Hertz, in Germany, really understood what was going on. His brilliant experimental proof of Scottish physicist James Clerk-Maxwell's theoretical predictions took place in 1888. However, the most significant work from the wireless telephone standpoint was performed by Amos Emerson Dolbear, Professor of Physics at Tufts College.¹⁸ Dolbear, in the early 1880s, conducted a number of experiments with induction coils, carbon and condenser telephone transmitters, and batteries in a wireless set-up with grounded wires at both ends of a communications link. The system was fully described in the *Scientific American* of Dec. 11, 1880 and a patent was awarded (No. 350299). Transmission range (mostly induction field) was limited to something less than one mile. Following the development of true radiation wireless telegraphy more than a decade later, it was realized that Dolbear's circuit configuration created a borderline situation in which he probably radiated electromagnetic energy to greater distances but lacked a suitable detector. The Dolbear patent was later used by the De-Forest radio interests in an attempt to prove priority over Marconi.¹⁹

By the mid-1890s a variety of experimentation in induction telegraphy and telephony was in evidence. However, the concept of modulating a high frequency carrier wave with voice perhaps can be ascribed to John Stone who, in 1892, utilized both induction coils and alternating current generators in experiments designed by AT&T to communicate by telephone with ships at sea. Although the inspiration for this series of investigations came from the work of Hertz and Tesla, and preceded Marconi by several years, Stone fell short of "inventing" radio partly by reason of the aforementioned confusion of induction with radiation, and partly by lack of appreciation of the need for such appliances as antennas and modulation detectors.²⁰

Reginald Fessenden

The credit for a major breakthrough in superimposing voice or music information on a high frequency "carrier" goes to Reginald A. Fessenden (1866-1932), whose persistence along these experimental lines culminated in what many regard as the first broadcast using a reliable continuous wave generator (the high frequency alternator) from Brant Rock, Massachusetts, on Christmas Eve, 1906.

The high frequency alternator essentially was a type of alternating current generator that produced "continuous waves" in the radio frequency range. The term "high frequency" is a misnomer by modern standards, since the device operated under 100 kHz. Although developed by Elihu Thomson and Nikola Tesla in the late 1880s, Fessenden probably was the first to apply it to radio communication.

Fessenden became interested in wireless during the embryo period of the 1890s, but realized very soon that conventional spark oscillators used for radiotelegraphy created too high a distortion level to make the radiotelephone practical. However, he conducted some tests along these lines in December, 1900, at Rock Point, Md. (Cobb Island, 50 miles south of Washington, D. C.) where distances up to one mile were bridged.²¹ He seems not to have had a really adequate detector on the receiving end, but the system was patented in 1902 (No. 706747) and constitutes the earliest registered invention in the United States for a radiotelephone system employing Hertzian waves. Some commercial radiotelephone sets using the spark system were marketed by Fessenden.

At the turn of the century, another development occurred which proved crucial for the growth of experimental broadcasting. This was the application of the high frequency arc to wireless. The oscillating arc was basically a circuit arrangement that included two carbon electrodes activated by high voltage and shunted by suitable inductance and capacitance. Investigated by Elihu Thomson in 1889, it was not until further work after 1900 by William Duddell in England and Valdemar Poulsen in Denmark that frequencies high enough for radio transmission could be realized. Although the arc did produce "continuous waves" and was a favorite of other experimenters, Fessenden felt uncomfortable with it because of its high distortion level and instability.²² As a result, he asked Charles Steinmetz of the General Electric Company to construct a 10,000 cycle alternator for him that would have some capability for modulation with voice or music information. Tests with this machine were made at the Washington, D. C. laboratory of the newly formed National Electric Signalling Company in 1905. Results were encouraging enough to construct a higher frequency machine for the use at NESCO's Brant Rock, Massachusetts installation. The engineering team at Schenectady was headed by E. F. W. Alexanderson, a talented young Swedish electrical engineer. An alternator was delivered to Fessenden in 1906, and after many technical difficulties made ready for its debut. On Nov. 21, 1906, a variety of scientific dignitaries, including Greenleaf W. Pickard and Elihu Thomson, witnessed tests in which speech was successfully transmitted 11 miles between Brant Rock and Plymouth, Mass.²³ A phonograph was on hand and was used to transmit music over the airwaves. On Christmas Eve, 1906, Fessenden and his group at Brant Rock presented a program of varied content for the holiday occasion; this was advertised to ship operators of the United Fruit Co. three days in advance. A similar schedule was presented on New Year's Eve. Ship reports of reception came from points as far away as Norfolk and the West Indies. The programming was described by Fessenden:

First a short speech by me saying what we were going to do, then some phonograph music . . . the music on the phonograph being Handel's "Largo." Then came a violin solo by me, being a composition by Gounod called "O, Holy Night," and ending up with the words "Adore and be still" which I sang one verse of, in addition to playing the violin, though the singing, of course, was not very good. Then came the Bible text, "Glory to God in the highest and on earth peace

to men of good will," and we finally wound up by wishing them a Merry Christmas and then saying that we proposed to broadcast again New Year's Eve.

The Broadcast on New Year's Eve was the same as before, except that the music was changed and I got someone else to sing. I had not picked myself to do the singing, but on Christmas Eve I could not get any of the others to either talk, sing or play and consequently had to do it all myself. On New Year's Eve one man — I think it was Stein — agreed to sing and did sing, but none of the others either sang or talked.²⁴

NESCO continued experimental work on the radiotelephone in July, 1907, and obtained distances up to 180 miles. The following excerpt from the log of wireless enthusiast Francis Hart shows the description of the transmission as received in the New York harbor area on Feb. 11, 1908, at 1:16 p.m.:

Wireless phone at Jamaica and other must be at Brant Rock, Mass. Phone very clear except for a rasping noise that mingles with the voice . . . I managed to get the following and could probably have obtained more except for "9" and etc.

"How's that now" "open up a little more"

"You came in louder than that yesterday"

Could hear music as clear as voice from weaker station but couldn't make out words from other station although they came in fair.²⁵

Although NESCO's wireless telephone activities continued for a time, the company ran into economic and administrative difficulties. The Bell System was quite impressed with Fessenden's wireless telephone, but AT&T suffered a major reorganization following the financial panic of 1907 and interest cooled. Fessenden and his financial backers also were on poor terms for several years, and the inventor was forced to leave the company in 1911. The following year NESCO went into receivership, though the organization continued in research and development activities until its purchase by Westinghouse in 1921. The alternator, for all its wizardry in wireless telephony, was too cumbersome a machine and the engineering fraternity preferred to endure the higher distortion level in the more portable Poulsen arc. The alternator's significance in radiotelegraphy would overshadow other use, as would its political effect in the battle over control of the early radio industry in the period during World War I and thereafter.

DeForest and the Arc Radiotelephone

Of all the members of the early wireless engineering fraternity, perhaps Lee DeForest, more than any other, had some vision of the broadcasting potential of the wireless telephone. Although possessing a Ph.D. in physics from the Sheffield School at Yale (1896), DeForest basically was an experimental electrician in the tradition of Edison rather than a mathematician such as Maxwell or Kelvin. He foresaw, at an early date, the application of the high frequency arc to modulated radio frequency transmission. In December, 1906, he succeeded in transmitting voice across his laboratory room in the Parker Building (19th Street and 4th Avenue, Manhattan) to a receiver employing a vacuum tube detector.²⁶ A number of experimental broadcasts were made early in 1907, and were picked up by ship operators in New York harbor.

In the summer of 1907 DeForest and his assistant, Frank Butler, went to Put-in-Bay on Lake Erie to report the Interlakes Association regatta from a radiotelephone installation aboard the *Thelma*. The Navy Department watched these activities closely and became aware of the potential of voice transmission as a tactical communication device. It should be noted, incidentally, that to promote this new invention the DeForest Radio Telephone Company was organized earlier in the year and a subsidiary, the Radio Telephone Company, was formed for the purpose of developing DeForest's patents. In September, the Navy ordered two complete transmitting and receiving units for installation aboard the *U.S.S. Connecticut* and *U.S.S. Virginia*. Trials were held in Cape Cod Bay, and were so successful that the Navy ordered another two dozen sets for installation aboard Admiral Evans' "Great White Fleet," which was scheduled to depart for an around-the-world cruise on December 16. DeForest and his co-workers slaved night and day to get the equipment ready. Due to hasty procedures and other technical problems, some of the transmitters were inoperable, but several vessels, including the *U.S.S. Ohio*, continued to experiment for the duration of the voyage.²⁷ By January, 1908, the arc aboard the *Ohio* was made sufficiently stable to operate for several hours at a time. Radio-telephone broadcasts were made to the assembled U. S. and Brazilian fleets and later to British and Chilean vessels as the expedition moved along the South American coastline. In April, while the fleet anchored at Long Beach, Calif.,

the radio crew aboard the Ohio procured a phonograph and proceeded to entertain local radio operators. The inspiration for these broadcasting activities may have come from some of DeForest's tests at the Brooklyn Navy Yard prior to the sailing of the Connecticut and the Virginia for New England waters. It was here that contralto Madame von Boos Farrar sang "I Love You Truly" and "Just-a-Wearyin' for You" to the radio operators in the port. On April 23, 1908 the DeForest Company gave a banquet in Los Angeles for the Fleet wireless telephone crew. Roscoe Kent, one of DeForest's assistants, casually mentioned to the assembled group that this was the "first meeting of radio broadcasters."

Admiral Evans' fleet continued its cruise to the Orient where additional radiotelephone programs were "beamed" to the Japanese Fleet at Yokohama harbor, and upon continuation of the journey eastward similar activities were conducted near ports in Ceylon, Arabia, Egypt, Greece, Turkey, and Gibraltar. Broadcasts also were made to several ocean-going liners. Upon return to the Brooklyn Navy Yard in March, 1909, the equipment was placed in storage. The Navy was not again equipped for wireless telephony until 1917.

A corollary episode was taking place about this time in New York City that has some bearing on our story. Dr. Thaddeus Cahill, a scientist from Holyoke, Mass., demonstrated a sophisticated musical tone system before a meeting of the New York Electrical Society in September, 1906. The new device was called a "Dynamophone" or "Telharmonium," and consisted of a bank of alternating current generators controlled to give musical tones of varying combinations. The Cahill Telharmonium Company occupied a large building at 39th Street and Broadway. The musical transmissions were played on an organ-type console and fed from the generating plant to distribution lines leading to various halls and restaurants where receiving telephonic speakers were installed. The system can well be termed the first serious venture into a background music system in this country. However, owing to the Bell Telephone Company's reluctance to give permission for use of conventional telephone lines (fearing damage to equipment), plans to extend the service to individual subscribers were seriously hampered. The Cahill Company was intrigued by DeForest's wireless telephone and gave permission for a trial broadcast of Telharmonium music over the air waves.²⁸ The programs took place in February and March of 1907 but apparently were not extended

further. One can only conjecture that the audio quality left much to be desired. DeForest at this time was using Poulsen's version of the arc, but attempting to improve performance by substituting steam for hydrogen.

While Admiral Evans' "Great White Fleet" was on its round-the-world trip, DeForest traveled to Europe and conducted several spectacular wireless telephone demonstrations from the Eiffel Tower, Paris, in Spezia, Italy and in Portsmouth harbor, England. Upon return to the United States, he occupied himself with several matters relating to his equipment manufacturing activities, though the radio-telephone was still operated almost daily. He returned to an intense interest in musical broadcasting during the winter of 1909. Then he made the acquaintance of Andreas Dippel, assistant director of the Metropolitan Opera House and, outlining the past experiences with the Telharmonium and phonograph, persuaded the management to allow experimental broadcast of grand opera. The principal event occurred January 13, 1910, when *Cavalleria Rusticana* and *I Pagliacci* were transmitted, with several famous soloists including Ricardo Martin and Enrico Caruso. This activity actually was conducted in conjunction with the National Dictograph Company, whose president Kelley M. Turner had designed a new "acousticon" pick-up microphone for stage use. The tests were arranged both to determine the feasibility of broadcasting opera to telephone subscribers over wire line, and to check out the similar capability of wireless. Although the broadcasts were reasonably successful, and repeated again later with staff from the Manhattan Opera Company, one can safely conclude that limitations in audio fidelity and instability problems with the arc made commercial exploitation premature. The Radio Telephone Company became the victim of early stock promotion schemes and went bankrupt in 1911. DeForest then transferred his activities to the West Coast and went to work for the Federal Telegraph Company.

In 1915, the American Telephone and Telegraph Company conducted significant tests in radiotelephony at the site of Navy station NAA, Arlington, Va. Using banks of vacuum tubes in oscillator and modulator circuits, signals were transmitted across the Atlantic and were heard as far away as Honolulu.²⁹ Possibly with this event as the stimulus, DeForest picked up his broadcasting activities again, this time from High Bridge in the Bronx. A new company backed the venture, the DeForest Radio Telephone and Telegraph Company, bol-

stered with 5 years of advance in technology and a firmer patent position. Of particular interest was the manufacture of "oscillion" transmitting tubes, now being produced with power ratings up to 125 watts. DeForest installed a transmitter at the Columbia Gramophone Building on 38th St. and began daily broadcasts of phonograph music with the Columbia company as the sponsor. The transmitting site was later moved back to the High Bridge tower. On election night, November 7, 1916, DeForest broadcast the Hughes-Wilson election returns for some six hours—erroneously proclaiming at 11p.m. (as did several newspapers) that the winner was Charles Evans Hughes.³⁰

The U. S. entry into World War I shut down all non-Government radio operations in 1917, but two years later DeForest set up operations again at the High Bridge location with call letters 2XG.³¹ Phonograph records this time were supplied by the Brunswick-Balke-Collender Company, which acted as sponsor. Richard Klein, of the DeForest sales organization, was the program director. In December, 1919, concert singer Vaughn de Leath appeared as soloist and made several broadcasts. The station later moved its facilities to the World Tower Building at 46th and Broadway to utilize better antenna facilities, but DeForest neglected to get a Government permit for the new location and the operation was ordered closed by the district federal radio inspector. This, together with other vexing legal troubles, prompted the inventor to once again head West. In San Francisco, the High Bridge transmitter was re-installed in the California Theater Building and daily broadcasts were made with Herman Heller's orchestral group. From this point on the story of the DeForest broadcasting activities becomes involved with the attempt of a group called the Radio News and Music Company to interest newspaper owners in the purchase of DeForest radiotelephone transmitters. The *Detroit Daily News* did so, and herein lies the start of the story of WWJ, whose predecessor 8MK began operation August 20, 1920, an event that will be recounted in a future article in the JOURNAL OF BROADCASTING.

West Coast Radiotelephony

The critical role of the high frequency arc and alternator in the growth of radiotelephony has been stressed. These devices were "continuous wave" generators, and were only reliable tools for voice modulation techniques prior to development of the vacuum tube oscillator. However, Marconi-type "damped wave" transmitters didn't necessarily preclude telephony if distortion caused by the spark ir-

regularity and low spark frequency could be minimized. In practice this was difficult to do, though Fessenden, as we have indicated, made some efforts in this direction.

In 1902, an amateur operator from San Francisco, Francis McCarty, began to experiment in spark telephony with a view toward development of a commercial system. The Henshaw brothers, influential bankers of Oakland, California, were persuaded to invest some capital in the new venture. However, McCarty was fatally injured in a motorcycle accident in 1906, and the project was temporarily interrupted pending the search for new engineering advice and leadership. In 1908, Cyril Elwell, an electrical engineering student at Stanford, was persuaded to join the McCarty Wireless Telephone Co. as a consultant.³² He proceeded to set up experimental broadcasting with a phonograph supplying the program content. Elwell realized that the McCarty system worked best when the transmitter spark gap was so narrow that the system operated as a quasi-arc, providing nearly continuous waves. Experiments were continued from the Company's Palo Alto laboratory until early 1909. At that time, Elwell advised the management that it would be useless to play around further with spark gaps, and that the Poulsen arc held the real future for wireless engineering. Elwell discovered that the U. S. patent rights for Poulsen's invention had not yet been granted. An inquiry to the Danish inventor revealed that something in the neighborhood of one-quarter million dollars was considered the proper "ball-park" figure. The Henshaw brothers were, however, disinterested in putting further investment capital into such new and uncertain ventures, and sold the laboratory to Elwell for a low figure. The account of how a young Stanford graduate then proceeded to buy the U. S. rights to a significant invention is a fabulous story that we have insufficient space to treat here; suffice it say that Elwell formed the Poulsen Wireless Telegraph and Telephone Co. with support from the Stanford faculty and a certain amount of good fortune perhaps possible only in the first decade of the 20th century. A considerable amount of experimental broadcasting and point-to-point radio telephony with stations at Stockton and Sacramento formed the principle wireless telephone "menu" of the day, with much of this work done for stock selling and promotion purposes. However, as with the alternator, the Poulsen arc's principal use would come with radio telegraphy, and Elwell's successor company, the Federal Telegraph Co., catered primarily to customers desiring high-powered telegraphic communication.

In the meantime, however, the "fall-out" from the arc technology spread to other experimenters. San Jose's Charles Herrold was the principal West Coast exponent of wireless entertainment in the pre-1920 era.³³ In Seattle, Washington, William Dubilier performed a variety of "broadcasts" in 1911-1912 using modulated sparks and arcs. Back in the East, A. Frederick Collins of Philadelphia, under the auspices of the Collins Wireless Telephone Co., marketed equipment of short range capability, but including spark and arc oscillators. In New York City, Alfred Goldsmith, Professor of Electrical Engineering at CCNY, operated a broadcasting station at the College in the 1912-14 period under call letters 2XN.³⁴

The above description of arc/spark events prior to 1914 indicate that quite a bit of activity was taking place apart from the work of Fessenden or DeForest, though these two personalities were still the most prominent on the wireless telephone scene. Between 1912 and 1915 there were some critical advances in electronic engineering, including the audio frequency amplifier (DeForest), regenerative amplifier and feedback oscillator (DeForest and E. H. Armstrong), and vastly improved high-vacuum triode radio tubes (Bell Laboratories and General Electric).

Sarnoff and the "Radio Music Box"

Early in 1914, the American Marconi station in New York's Wanamaker Building was refurbished with a low power vacuum tube transmitter for experimental broadcasting of phonograph music. David Sarnoff, Contract Manager for the Company, had sailed aboard the *S.S. Antilles* for New Orleans to attend a convention of Railway Telegraph Superintendents. By advance scheduling, the Wanamaker station was tuned in while the vessel was about 60 miles away from New York. This incident appears to have influenced the young executive, and, coupled with some fast breaking technical developments (such as E. H. Armstrong's feedback circuit and the Bell Company's radiotelephone tests) led to the famous "Radio Music Box" memorandum of Sept. 30, 1915, addressed to Edward J. Nally, Vice President and General Manager of the Marconi Wireless Telegraph Company of America:

I have in mind a plan of development which would make a radio a "household utility" in the same sense as the piano or phonograph. The idea is to bring music into the house by wireless.

While this has been tried in the past by wires, it has been a failure because wires do not lend themselves to this scheme. With radio, however, it would seem to be entirely feasible. For example, a radio-telephone transmitter having a range of, say, 25 to 50 miles can be installed at a fixed point where instrumental or vocal music or both are produced. The problem of transmitting music has already been solved in principle, and therefore all the receivers attuned to the transmitting wavelength should be capable of receiving such music. The receivers can be designed in the form of a simple "Radio Music Box" and arranged for several different wavelengths, which should be changeable with the throwing of a single switch or pressing of a single button.

The "Radio Music Box" can be supplied with amplifying tubes and a loudspeaking telephone, all of which can be neatly mounted in one box. The box can be placed in the parlor or living room, the switch set accordingly, and the transmitted music received. There should be no difficulty in receiving music perfectly when transmitted within a radius of 25 to 50 miles. Within such a radius, there reside hundreds of thousands of families; and as all can simultaneously receive from a single transmitter, there would be no question of obtaining sufficiently loud signals to make the performance enjoyable. The power of the transmitter can be made 5 kilowatts, if necessary, to cover even a short radius of 25 to 50 miles, thereby giving extra-loud signals in the home if desired. The development of a small loop antenna to go with each "Radio Music Box" would likewise solve the antenna problem.³⁵

A typical transmitter of 1915 or 1916 would be a vacuum tube oscillator (or a Poulsen arc, if one could stand the noise) with necessary speech modulation equipment. The home listener could use a simple crystal set or perhaps one of the single-tube receivers then available to amateur radio operators.

An obvious question would be: If all the necessary appliances for radio broadcasting were here in 1915, why wasn't broadcasting itself?

As so often happens with benefit of hindsight, we may be able to deduce more from the evidence than really applies to the situation. It would seem, however, that Sarnoff's proposal was perfectly reasonable, considering the state of the art as well as the past experience of DeForest and the Bell System engineers not to mention the full gamut of wired and wireless telephony development since Alexander Graham Bell's demonstrations of the telephone 40 years earlier.

The answer, it would seem to us, is two-fold: (1) A lack of appreciation of the entertainment and information capability of the

radio-telephone ("the time isn't ripe yet" cliché); and (2) a turbulent patent situation leading to all sorts of manufacturing difficulties.

In September, 1916, the courts ruled that DeForest had infringed the two-element Fleming Valve patent, and the Marconi Company had infringed the three-element DeForest "Audion" tube patent. Nobody could manufacture triodes—absolutely essential for vacuum-tube transmitters and for tube-type receivers. Then the General Electric Company and AT&T became involved in patent interferences on the "feedback circuit" used with the triode.³⁶ Although there was a Navy-inspired truce for the purpose of aiding the war effort during World War I, this paralysis was not really resolved until the post-war cross-licensing agreements between the industry giants. Then broadcasting really had a chance to flourish.³⁷

Footnotes

¹ E. N. Sivowitch, "Musical Broadcasting in the 19th Century," *Audio* (June, 1967), 19-23.

² Sivowitch, *Op. Cit.*; David L. Woods, "Semantics versus the First Broadcasting Station," *JOURNAL OF BROADCASTING*, XI:3 (Summer 1967), 199-207.

³ *Infra* (Section on DeForest). The Telharmonium was an "electrical music" generator.

⁴ *Electrical Review*, 25 (Nov. 21, 1894), 259.

⁵ William H. Ward, *Ward's Code of Signal Telegraph for Ocean Marine Service* (Auburn N.Y.: W. H. Ward, 1858).

⁶ Loomis Notebook, Mahlon Loomis Papers, Manuscripts Division, Library of Congress.

⁷ Thomas Appleby, *Mahlon Loomis: Inventor of Radio*. (Washington, D. C.: Loomis Publications, 1967) 101-104.

⁸ No. 129971. Appleby feels that Loomis definitely radiated a signal with his apparatus, and received it with some type of rectifier action or magnetic detector effect in the galvanometer circuit.

⁹ Samuel F. B. Morse had conducted experiments as early as 1842. See J. J. Fahie, *A History of Wireless Telegraphy*. (New York: Dodd, Mead & Co., 1902).

¹⁰ Drawbaugh was a mechanic from Eberlys Mills, Pennsylvania, who worked on telephonic devices in the 1860s and 70s. He lost a legal decision to Bell by a very close margin. See Warren J. Harder, *Daniel Drawbaugh: The Edison of the Cumberland Valley*. (Philadelphia: University of Pennsylvania Press, 1960).

¹¹ The "acoustic telephone" was essentially a "tin-cans-and-string" telephone for house-to-house communication. Believe it or not this type of device had some commercial application during the same time span as the first electric telephones, circa 1875-1895. Stubblefield had a patent on his device.

¹² Tom Hoffer, "Nathan B. Stubblefield and His Wireless Telephone." JOURNAL OF BROADCASTING (forthcoming).

¹³ Prospectus, Wireless Telephone Company of America, Clark Collection CWC 4-3340A. (See "note on sources" at end of footnotes).

¹⁴ U. S. Patent No. 887,357 (May 12, 1908); Canadian Patent No. 114,737 (Oct. 20, 1908).

¹⁵ The tendency to radiate increases as the square of the frequency.

¹⁶ Nor the case of high powered VLF stations used for communication with submarines, such as the Navy station at Cutler, Maine, which operates on 14.7 kHz. In this instance more than a megawatt of power is radiating from the antenna system.

¹⁷ Charles Süsskind, "Observations of Electromagnetic Wave Radiation before Hertz," *ISIS* 55 (March, 1964), 32-42.

¹⁸ *Ibid*, 37-39.

¹⁹ *Marconi Wireless Telegraph Co. of America vs. DeForest Wireless Telegraph Co.* United States Circuit Court for the Southern District of New York. In Equity No. 8211 (1904).

²⁰ We are indebted to J. Brittain of the Georgia Institute of Technology for calling our attention to the early Stone experiments. See Clark Collection SRM 4-1230, John Stone Stone, Report (1892) Mechanical Department of American Bell Telephone Co. Also commentary in letter of Dec. 22, 1944 from Lloyd Espenschied to G. H. Clark, CWC 4-2839A. A published source is George H. Clark, *The Life of John Stone Stone*. (San Diego: Frye and Smith Ltd., 1946) 35-37.

²¹ Helen Fessenden, *Fessenden: Builder of Tomorrows*. (New York: Coward-McCann, 1940), Chapter XV. See also, R. A. Fessenden, "Wireless Telephony," *Transactions of the American Institute of Electrical Engineers*, 1908. Clark Collection CWC 135-178A.

²² The distortion level, while less than that of the spark radiotelephone, was worse than that of the alternator.

²³ John Grant, "Experiments and Results in Wireless Telephony," *The American Telephone Journal*, (January 26 and February 2, 1907).

²⁴ Letter of January 29, 1932, Reginald A. Fessenden to S. M. Kintner, Vice-President, Westinghouse Electric & Mfg. Co. Clark Collection CWC 135-246A.

²⁵ Call Letters and Log Book of Francis Arthur Hart, 1906-1909. Smithsonian Institution Cat. No. 329,734. Hart also reports the DeForest arc experiments of March 20, May 7 and May 9, 1907.

²⁶ Lee DeForest, *Father of Radio*. (Chicago: Wilcox-Follett, 1950), 221.

²⁷ H. J. Meneratti was wireless operator aboard the Ohio. The basic research material for this section is based upon his notes in the Div. of Electricity & Nuclear Energy files of the Smithsonian. See also data in Clark Collection Class 134 History of Broadcasting and Class 135 History of Radiotelephony. A good published source is L. S. Howeth, *History of Communications-Electronics in the United States Navy*. (Washington: Government Printing Office, 1963), 169-172.

²⁸ DeForest, *Op. Cit.*, 225; Georgette Carneal, *A Conqueror of Space*. (New York: Horace Liveright, 1930), 205-209.

²⁹ R. A. Heising, *Montauk-Arlington Radio Telephone Tests of 1915* (1938), Clark Collection CWC 135-085A. A brief account of the tests is contained in: William Peck Banning, *Commercial Broadcasting Pioneer*. (Cambridge: Harvard University Press, 1946), 6-7.

³⁰ DeForest, *Op. Cit.*, 338.

³¹ U. S. Department of Commerce, *Commercial and Government Radio Stations of the United States* (1920).

³² A full account of Elwell's role in radio engineering may be found in: *Pioneer Work in Radio Telephony and Telegraphy* by Cyril Elwell. (Smithsonian Institution: Clark Collection CWC 135-245A). A popularized though extensive account of West Coast developments may be found in Jane Morgan, *Electronics in the West: The First Fifty Years*. (Palo Alto: National Press Books, 1967).

³³ Herrold's role will be fully discussed in Joseph E. Baudino's future article, which will consider individual station histories. See also Gordon B. Greb, "The Golden Anniversary of Broadcasting," *JOURNAL OF BROADCASTING*, III:1 (Winter, 1958-59), 3-13.

³⁴ U. S. Department of Commerce, *Radio Stations of the United States*. (1914 and 1915 editions).

³⁵ Eugene Lyons, *David Sarnoff: A Biography*. (New York: Harper & Row, 1966), 70-73; David Sarnoff, *Looking Ahead*. (New York: McGraw Hill, 1968), 31-34; Gleason Archer, *History of Radio to 1926*. (New York: American Historical Society, 1938) 110-113.

³⁶ The complexities of the patent problem are told in W. Rupert MacLaurin, *Invention and Innovation in the Radio Industry*. (New York: Macmillan Co., 1949).

³⁷ Letter of Jan. 31, 1922 from David Sarnoff to C. D. Young of RCA restates the "Radio Music Box" proposal, and discusses its previous introduction in 1915 as well as another memorandum of Jan. 31, 1920. Sarnoff does mention the lack of a suitable radiotelephone transmitter and compact receiver in the earlier period, inferring that this retarded the introduction of broadcasting. It might be argued, however, that had the industry responded with some inspiration to his initial proposal, some of the difficulties vis-a-vis the patent situation could have been resolved. In point of fact, the equipment needed for broadcasting was close to practical realization. The Bell System's radiotelephone tests of 1915 included oscillator, modulator and power amplifier tubes. DeForest's "oscillon" transmitting triodes were also available that year. Receivers such as the DeForest RJ-4 and RJ-5 audion detectors, with necessary receiving transformers were available in 1914 at prices in the \$26-40 category. These would fulfill the "Music Box" criterion, albeit with lack of sensitivity compared to later circuitry. As fate would have it, however, World War I provided the training ground for many of the first radiotelephone applications and for mass production of vacuum tubes, since manufacturers agreed to suspend any patent litigation for the duration of the war.

Note on sources: The Clark Collection of manuscripts and photographs is located at the Smithsonian Institution's Division of Electricity and Nuclear Energy. One of the most extensive collections of documents pertaining to the history of radio technology, it was compiled by George H. Clark (1881-1956), who was RCA's historian for more than 30 years. The Collection was used extensively by L. S. Howeth in his work (cited in footnote 27).

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6. Heathkit
7. Eico

I am indebted to Walt Curry for taking the picture of the Superior Channel Analyzer and at \$19.75 it was a bargain. I quote from the manual, "The Channel Analyzer will;

1. Follow signal from antenna to speaker through all stages of any receiver ever made.
2. Instantly track down exact cause of intermittent operation.
3. Measure both automatic-volume control and automatic-frequency control, voltages and circuit without

appreciably loading the circuit, using built in highly sensitive vacuum-tube voltmeter.

4. Check exact gain of every individual stage in receiver.
5. Track down and locate cause of distortion in rf, if, and af amplifiers.
6. Check exact operating voltage of each tube.
7. Locate leaky condensers and all high resistance shorts, also show opens.
8. Measure exact frequencies, amount of drift and comparative output of oscillators in superhets.
9. Track down exact cause of noise."

PRIVATE MUSEUM OPEN

Another SCARS member announces his private museum of radio equipment is available to be seen. Please call for an appointment.

Langlo's Wireless Museum in Santa Barbara, Ca. (805) 964-2522, is open most of the time. Pete says there are about 2,000 articles on display. Items include radio parts, head sets, battery sets, 1930's AC sets, crystal sets, railroad telegraphy

sounders from the 1890's, 1937 Wurlitzer juke box, books and magazines that go back to 1914, a showcase full of sockets, variometers, etc., and many more things. Hear the sound of a spark transmitter. Many things from Goleta's past are also on display. You'll not be disappointed you visited. Call E. Pete Langlo and make an appointment.



BOOK REVIEW

by Joe Knight

Wireless Communication in the United States by Thorn L. Mayes (243 pgs) pub. by The New England Wireless and Steam Museum, 697 Tillinghast Rd., E. Greenwich, RI, 02818. \$29.95 plus \$3.00 shipping and handling. Also available from other usual radio book sources.

Those of you who are familiar with Thorn Mayes (now deceased) and his previous articles on early wireless history will no doubt find this volume to be immensely enjoyable for its content and very invaluable for its facts, photos and charts. Arthur Goodnow, along with Robert and Nancy Merriam, prepared the original manuscript for publication doing the editing, proofing, and organizing. Although much of this material was published in a variety of other publications this one source helps give the reader a very useful overall perspective not found anywhere else.

The opening chapter deals with the early technology and equipment development occurring prior to WW I. The main chapter deals with the various operating companies from the legitimate to those promoted solely for their stock value. This is where some of the most interesting material is found.

Seeing how interdependent most of these companies were is quite revealing. The rule of the day back then was either merger, bankruptcy, stock spin-offs, acquisition (either outright or through patent litigation) or licensing formation. More often than not the head of the company was strictly a promoter, and not an inventor or engineer.

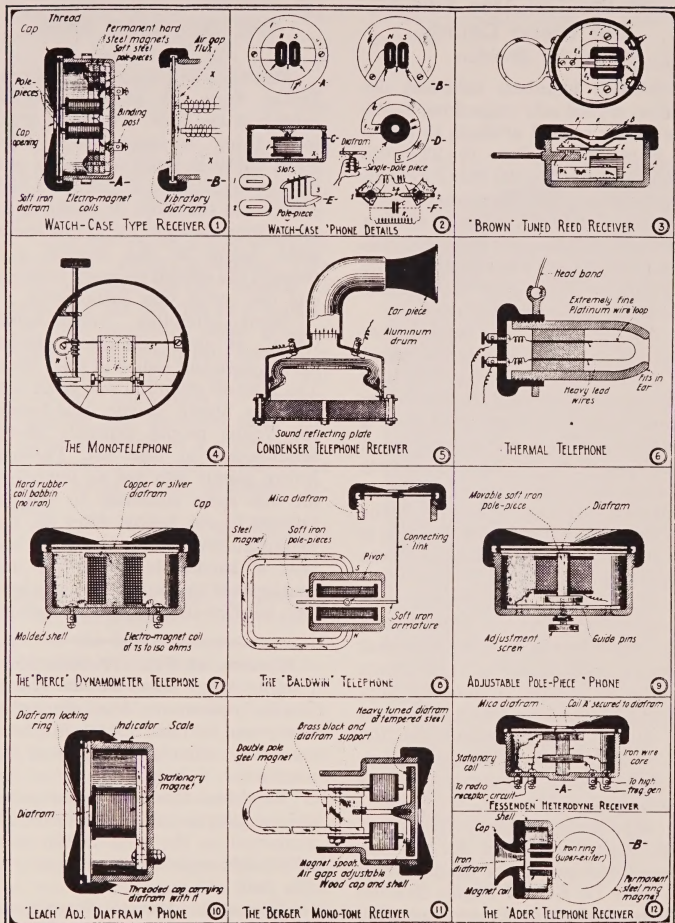
Lastly, there is an excellent section on the Alexanderson Alternator system and also on Harry Shoemaker. Overall, this is an indispensable reference not only for the historically oriented but also the equipment collector. While it may seem a little pricey for a softbound issue you should find it a real wealth of information.

NEW MEMBERS VOTED IN

The following new members were voted into membership at the last SCARS meet.

Dennis Cody & Marla Banuelos
R. E. Bender
G. H. Shields
Wm. Landsiedel
John Wendt
Matthew Parkinson
David Lasseron
Lyle Johnson
Joe Pestano
Peter Schmid
Hohan von Stietz
Phil Beautrow
Robert Salisbury
Fred Nuesca
David Gilbert
Larry Dunn
Paul Dodd
Clyde & Lois Watson
Steve Athenasen
Scott Holderman
Mark Bender
Larry & Hanne Panquin
Al Wendelbo
Bert Alton, Jr.
Erich & Judy Hoerchner
Neal Kissel
Stan Kann
Don Pettee
Leroy Sparks
Floyd Bocox
Denise Nelson
Wm. C. Armstrong
Matt Erdahl
K. P. Ohka
Ralph Gutenplan
Frank Conti
Miles Thomas
Barton Williams

THE HOW AND WHY OF RADIO APPARATUS—RADIO RECEIVERS



SCARS Member Exhibit at the Del Mar Fair, San Diego County

by Ed Sheldon

SCARS members exhibited old radios, crystal sets magazines, books and other related artifacts in two 8 ft. glass cabinets June 15 -22 at the Del Mar Fair. The Del Mar Fair is an annual event. It is the second largest Fair in California. Over 1 million persons are expected to attend this year. Our display was removed in the late afternoon of June 22 to make room for another exhibit.

We displayed in the Hobby Show tent which was located in the infield of the Del Mar race track. Our host was Eva Peterson who is the Hobby Show Superintendent, who was a very helpful and gracious person. I must explain that many of the events are in huge tents this year due to an extensive renovation program to the permanent buildings and that this is the first time they have used the infield for displays.

We received many compliments for our display and Ms. Peterson said she would like to have us back next year. Thanks to Antique Electronic Supply of Tempe, Arizona for supplying 100 catalogs which were used as hand out items. Also over 100 SCARS applications were given out. Bulletins from various other clubs were displayed.

Credits and thanks to the following: Walt Curry and Ed Sheldon loaned and set up the display items on June 14; Ed and Phyllis Sheldon did booth duty on Friday, Saturday and Sunday; Walt and Mary Curry did booth duty on Tuesday; Morgan McMahon on Wednesday; Floyd and Dorothy Paul on Friday. Floyd and Dorothy Paul, and Ed and Phyllis

Sheldon dismantled the display Friday evening.

THE DEL MAR FAIR

by Floyd Paul

Dorothy and I spent eight hours, Friday June 22 at the SCARS exhibit at the Fair. We talked with some thirty or more people who made inquiries about old radios, our display, or SCARS. A rock band just outside our tent kept us awake most of the time. Morgan McMahon spent eight hours at the exhibit and thought the exhibit was well received and the crowd was enthusiastic.

Many attendees "remembered when" as they reminisced about earlier days and radios in their lives. The greatest attention was given to a common brown plastic, mid-forties set. Young people, typically 25-40, commented on that set. Perhaps brown plastic sets are an invitation for non radio collectors to express interest in our hobby. After all, the manufacturers made them by the tens of thousands if not the one hundreds of thousands. It was a long day, but Dot and I enjoyed ourselves.

Minutes of Feb. 17 Meeting

Our swap meet at the Velvet Turtle restaurant was somewhat dampened by rain, but the luncheon was fully attended in spite of the weather.

President Chuck Strozier called the meeting to order at 10:45AM. He remarked on the very healthy state of SCARS, especially for this early in the year.

Treasurer Murrel Crump reported that we have several thousand dollars in the account. The largest 1990 budget item is publication of the *Gazette*. Other expenses include insurance and misc. items.

Membership Secretary Mary Ireland announced that we have a paid membership of 860 members, phenomenal for this early in the year. The mailing of reminder postcards was key to this feat. We voted 77 new club members in at this meeting.

Jerry Simpson of our club shared his great cabinet restoration expertise with us in his pre-luncheon presentation.

After the Velvet Turtle sandwich luncheon, Jerry presented his method of restoring the "innards" of radio sets. He did this in a manner that our members with even a smidgen of electrical knowledge could follow. The bottom line is that if you don't know what you're doing, guarantee your personal safety and success by going to a professional.

Thanks to Morgan McMahon for taking notes in my necessary absence.

Ed Sheldon,
Secretary

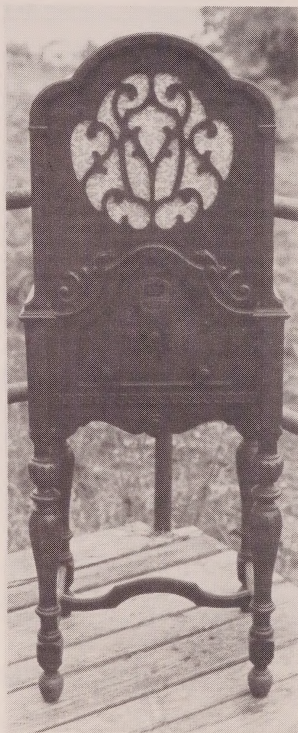
Minutes of the May 19 Meeting

SCARS president Chuck Strozier opened the business meeting at 11 AM. Treasurer Murrel Crump reported that the club finances were in good shape. Membership Secretary Mary Ireland asked for approval of 38 new SCARS members. This was so moved and passed. A resolution of congratulations to Dorothy and Ed Scott for their 49th wedding anniversary was noted.

Secretary Ed Sheldon announced he was absent from the Feb. 17th meeting due to a family emergency and those minutes would be published in this *Gazette*. He also mentioned the Marriott Hotel, which was close by, was a rest and a good price. Floyd Paul, *Gazette* Editor,

announced that he needs more articles for the *Gazette*. President Strozier then adjourned the business meeting.

Ed Sheldon
Secretary



Information about this set, anyone? Thomas Peters, Box 3925, McAllen, TX., 78502, wants to know if anyone can help with information about this "REMLER MINUETTE."



Confucius has said:
The accomplishment
of great things
consists
In doing small things
Well —
Perfection of
detail —

makes the
Grebe Receiver

What
it is =



The Grebe CR-5 Receiver

GREBE RADIO
Doctor Wfu.

For Sale or Trade & Want Ads

ADS MUST BE SUBMITTED EACH TIME FOR EACH PUBLICATION AND ARE FOR PERSONAL USE ONLY. SCARS WILL NOT PRINT REPETITIOUS ADS. ALL ADS ARE SUBJECT TO EDITING. SCARS IS NOT RESPONSIBLE FOR ANY TRANSACTION OR THE CONDITION OF ITEMS ADVERTISED.

Want: 1938 RCA models 816K, and ACR-111. P. Beautrow, 120 Cedar Ln., Santa Barbara, CA 93108. (805) 962-8957

Want: Early transistor radios. Plastic. Made in Japan or America. Working or not. Eric Wrobbe, 20802 Exhibit Court, Woodland Hills, CA. 91367, (818) 884-2282.

Want: Information on Western Electric Transmitting tube #228-A. Approx. date is 1929 and it is champagne bottle shaped of the water cooled variety. Application use of the tube is also sought. Sam Wrenn, 2314 Seminole Dr. #1207, Arlington, TX, 76010. (817) 860-1101

Want: Complete chassis for a Philco 90 table top radio. Fred Nuesca, 1212 Comstock Pl., Newberry Park, CA 91320, (805) 498-7229

Want: Hallicrafters Dual Diversity DD-1 receiver. Prefer optional wood speaker stand. Jim Clark, 1292 Starboard, Okemos, MI 48864, (517) 349-2249.

Sale: Stromber-Carlson tv from early 50s. Four feet high, lovely wood, and saloon type doors. Built-in record player. Truck, \$100 and first buyer gets it. Jeff Birkel, (819) 963-5658.

Want: Wiring diagram for Hickok 580B tube tester, Garod model V Neutrodyne, Dubilier-Duratron RF transformer 220-550 meters, Weco 205D/E tubes, three 201A to UV 199 tube adaptors. Have battery harness cable for Radiola 28-like new and lid for Radiola 60. T. Drogoski, 507 Coal Valley Road, Clairton, PA 15025.

Want: AK breadboard parts or complete sets. Any condition. Paul Thompson, 315 Larkspur Dr., Santa Maria, CA 93455. (805) 934-2778.

Sale: Amplion horn with repaired bakelite bell (pick-up only) \$100., Radio Doings mags 1928-1929 four for \$12., Magnavox 22" dia. horn speaker bell (only bell) \$100., Clymer book with Greenwood signature \$20., Federal 417, see p211 of Douglas book \$200., 5V-2A regulated power supplies \$10., F. A. Paul, 1545 Raymond, Glendale, CA 91201, (818) 242-8961.

Want: Old meters/galvos working or not. Your firm price. Cashiers check. Leonard Cartwright, 113 Sea Terrace Way, Aptos, CA 95003, (408) 662-2977.

Want: Information regards theft of my Australian mfg. WW II HRO rcvr., Model AMR-101, S.N. 158-SC-CD-412-44, mfg. by Amalgamated Wireless, Sydney, Australia, with coil 1.9 to 4 mc. Ward Becht, 625 Tufts Ave., Burbank, CA 91504. (818) 842-3444.

Want: Tube data index N-101 charts for Navy TV-4A/U tube tester. Ward Becht (see above for address)

Want: Information on RCA model 100 loud speaker. What are the two types of paper used for the cone border? Where can I find materials for restoration?. Also want parts for RCA model 17, pot metal tuning dial wheel and escutcheon, volume knob and pilot lamp shield. Also want early Magnavox and RCA speakers. Will swap or sell Pilot single drum dial vernier type with decorative scrolled face plate and fittings in original box. Eddie Maddocks, 190 Roberts Road, Greenacre, N.S.W., Australia, 2190. phone No. 02-642.

Sale: Small xmitting tubes, cathode ray tubes, etc. SASE for list. Want: National Regenerator kit, BC-342, Cabinet for Kennedy XXX. Alan Smith, 6368 Charing St., San Diego, CA 92117. (619) 268-3620

Want: ARRL manual, any from 1934 to 1940, covers missing OK. James Newton, 1952 E. Fork Rd., Williams, OR 97544. (503) 846-6647.

Sale: Have developed customized restoration kit which provides everything for the restorer. Customers express great satisfaction with this kit. For information about the kit write: Dan Healy, 25 Maple Road-P.O. Box 764, Woodacre, CA 94973, (415) 488-4596

Sale: 1939 RCA "TRK-120" Mirror-in-lid TV. Good cond. orig. picture tube. Best offer over \$4,000. Also 1956 RCA CTC-5 color TV w/full door provincial cab. in very good cond. \$450. obo, Steve Dichter (213) 463-3694. Hollywood, Calif. .

Sale: Many old radios, crystal sets, parts, spark equipment, test equipment, and old meters. Also 78 rpm record collection of 1920's and 1930's. Some books and magazines. Ralph Earnstein, W6SPQ. (818) 363-3078

PROGRAM SPEAKER

Alan Kleiman, noted TV and phonograph collector, will speak on TV collecting as a hobby. Alan is known to many SCARS members.

GAZETTE DEADLINES

All ads, material and articles for SCARS *Gazette*:

February issue December 1
May issue March 1
August issue June 1
November issue September 1

Announcement: Please remind all other club members you know to renew their subscription for 1990. Non-renewed members will not be receiving this *Gazette*.

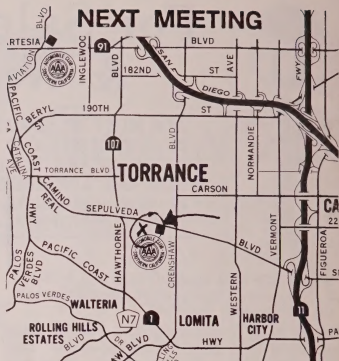
Cone Speaker Repair

Dan Mason reports he has used a reconing service at 840 Cypress Ave., Los Angeles, CA. 90065, (213) 221-3714 and found it very satisfactory. Ask for Eddie's speaker repair.



Mark your calendar for the 2nd annual two day autumn meet in Norwalk, California and it will be at the same site, now called "Saddleback" Inn. (3rd Fri. and Sat. of Nov., 1990) Details in the next *Gazette*.

Election of Officers and Directors will be held. A program of good speakers will be noted in the next *Gazette*.



AUGUST MEET VELVET TURTLE

3210 W. Sepulveda Blvd.
Torrance, CA.

NOTICE

Only SCARS members may sell at SCARS meets.

MEMBERSHIP DUES

Effective immediately, send all new and renewal dues payments to Mary Ireland, 24100-E Avenida Rancheros, Diamond Bar, Ca. 91765.

NEW MEMBER POLICY

Membership in SCARS follows the current calendar year. Anyone joining during Jan.-Sept. is enrolled for the current year and is sent all back issues of the *Gazette* for the current year. The member then continues to receive the rest of the current year's *Gazettes*.

Applicants for membership after Sept. are enrolled as members for the following year. They receive a notice of the year end meeting as well as other current club announcements and are told they will commence receiving *Gazettes* during the next year.